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A MANUAL

— 25 —

INHALERS INHALATIONS AND INHALANTS

AND

GUIDE TO

—THEIR DISCRIMINATING USE—

IN THE TREATMENT

OF

COMMON CATARRHAL DISEASES

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RESPIRATORY TRACT.

— 26 —

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GEORGE S. DAVIS,
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INTRODUCTION.

I am convinced that a small book on inhalers, inhalations, and inhalants, is needed by general practitioners of medicine. First, because the text-books for sale are somewhat out of date. Second, because those obtainable do not answer actual requirements, owing to their size and completeness. By this criticism, I mean particularly that many inhalers are described in detail, which are no longer employed at all—and, indeed, never were used, except perhaps by the inventors—and views are related at length, which were formerly debatable, but now are settled definitely. I am of the opinion, also, that books of this sort, are useful only when based upon personal experience, and also provided they express individual convictions, and not simply the opinions of others.

CHAPTER I.

MEDICATED SPRAYS,

The kinds of atomizers in ordinary use are numerous.

Some throw a very coarse spray, like Leffert's (fig. 1), and are mainly useful as instruments for



FIG. 1.—LEFFERT'S NASAL SPRAY APPARATUS.

cleansing purposes in diseases of the nose and throat; others project a medium coarse spray (fig. 2) or a quite fine spray (fig. 3), and, with proper limitations, are serviceable as a means of local medication.

All hand atomizers are worked by means of either a single, or by two rubber bulbs. Two bulbs produce a continuous spray, as the middle bulb, or the one next the bottle of the atomizer, acts as a receiver

for compressed air. A single bulb causes an interrupted spray, which is almost continuous whenever the bulb is pressed repeatedly and rapidly with the hand. If a continuous spray is in use, the end bulb must not be pressed upon previous to withdrawal of the nozzle, during the time the middle bulb is emptying



FIG. 2.—GOODYEAR FLEXIBLE TUBE ATOMIZER.

itself of the compressed air. Otherwise the spray will continue to be formed, and, whenever the nozzle of the atomizer is removed from the nares, or mouth, will wet and soil the patient's face and clothing. It can be appreciated how annoying this occurrence is, both to the patient and physician, and particularly, if a staining fluid like nitrate of silver, or iron, is used.

If the bottle of the atomizer contains a non-stain-

ing liquid, the resulting damage, or disagreeable effect, is not so great.

The advantage of the single bulb lies in the fact that when the pressure with the hand ceases the effect passes away within a few seconds, and the spray stops, and in withdrawing the instrument, there is little, or no risk of wetting the patient with the atomized fluid.



FIG. 3.—DAVIDSON HARD-RUBBER ATOMIZER,
CONTINUOUS SPRAY (WITH TWO TIPS).

In the Goodyear Atomizer (fig. 2), the tubes being made of fine metal, may be bent at will, and the volume of the spray can be regulated by straightening the tube, and then turning the *inner tube* to right or left. Do this before using the tube, thus assuring such a spray as may be desired. The inner tube may be unscrewed and removed for facility of cleaning it if it should become clogged. The sim-

plicity of its construction, and its adjustability to most cases, render this a very desirable instrument.*

The most improved form of atomizing tubes are those known as Sass' spray-tubes (fig. 4). They were



FIG. 4.—SASS' HARD-RUBBER SPRAY TUBES.

originally made of glass. They are now made of metal and hard rubber. The latter tubes are less liable to break than the former. Neither do they separate from each other, since the two tubes, horizontal and vertical, are not cemented together, but are joined firmly by solder, or rubber. The tubes of Sass, in order to be effectually used, must be employed

*The description here given is taken from the Goodyear Company's circular, and only changed so far as to be, in my opinion, entirely accurate.

by means of compressed air from a suitable air-receiver which contains air under a pressure of at least 20 to 30 pounds to the square inch (fig. 5). It is



FIG. 5.—COMPRESSED-AIR SPRAY APPARATUS.

manifest that no such pressure can be kept up for any length of time with the ordinary hand bulb, as the fatigue of working it would soon become too considerable for anyone of moderate strength. Further, it is probable that the bulbs, or bulb, would soon give way, or lose their elasticity, and thus become inoperative.

Many of the hand-ball atomizers, as well as the spray-producers of Sass, work upon the same principle. The cold medicated fluid is contained in a small bottle of suitable shape and size. Into this

bottle, and to within a few lines of its bottom, passes the lower portion of the vertical spray-tube. Ordinarily—although this is not an absolute requirement for use—this spray-tube is held tightly at the neck of the bottle by a perforated stopper in rubber or cork, through which it passes. A small triangular wedge is cut on the margin of the stopper and through its entire length, so as to allow the air-pressure to exert itself upon the surface of the fluid in the bottle.

To the proximal extremity of the upper tube of the atomizer, the rubber tubing, connected with the rubber bulb, or bulbs, is attached. When pressure is made with the single bulb, the air from it is driven with more or less force directly along the horizontal tube of the spray tube. Of course when two bulbs are used the air passes first into the middle bulb and then from it through the horizontal tube, and escapes at its distal extremity. The current of air thus produced draws up, on account of the vacuum formed in the lower tube, the liquid in the bottle, which is transformed into spray very near the two spray-tubes at their farthest end, when they incline to each other at right angles.

In many hand-ball atomizers the pressure of the air from the bulb acts directly upon the surface of the liquid contained in the bottle of the spray-producer through a hole or tube, merely passing through the stopper. The liquid in the bottle is thus forced up through a somewhat fine tube which enters it, as

in the other form described, and owing to progressive narrowing of this tube, when the liquid approximates its outer extremity, or tip, it takes the form of spray. The walls of the tip itself have everywhere a thickness of several lines, and its shape is ordinarily oval. Sometimes the tip, instead of being fixed upon the tube, which goes to and passes through the stopper and into the liquid, is movable, and is either slipped or screwed on the extremity of this tube. In that case several tips of different shapes and curves are usually sold with the same atomizer.

In the instrument just described, the inner tube terminates by a small orifice, when it reaches the movable tip, but not yet small enough to produce a spray, so that when the movable tip is taken off and the bulb worked with the hand, the liquid flows from it in a very small stream, and a spray is produced only when the movable tip is replaced. A precaution, in regard to the use of movable tips in the throat, is worth mentioning. Never make use of a movable tip, in spraying either the larynx or the naso-pharynx, which slips on the main tube of the atomizer, as it is liable to fall off and lodge in the throat, thus causing distressing and dangerous asphyxia.

Movable tips of any kind are rendered unnecessary by the use of Goodyear's atomizer, as in this one the main tube can be bent in any required direction, without obstructing the inner tube, or interfering at all with the formation of a spray. The objections to this form

of atomizer are two. 1. If the tip or tube becomes occluded it is cleared with more difficulty than those atomizers in which the tip is movable, and the inner tube at its distal extremity is of somewhat larger calibre.* 2. By reason of the relatively soft quality of the rubber of which the outer layer of the spray tube is made, it is not so durable when bent frequently, as the more solid spray producer made of hard rubber. Still, despite these objections, I have found it to be a serviceable instrument and therefore recommend it. Usually, when its terminal extremity has become obstructed, I have been able to loosen any impacted substance, if it be soluble, by soaking the end in warm water for a few moments; afterwards the force exercised by the bulb is sufficient to free it completely. A slender wire is, also, often serviceable for the same purpose, when the other method fails. A hard rubber atomizer made by Riker (fig. 6) is provided with a tongue depressor of the same material attached to the tube. This addition is very practical as it enables the physician or patient to use it with great advantage in holding the tongue down and out of the way of the spray. In regard to the utility of *cold medicated sprays*† and the instruments, of course, which produce them, opinions

*This objection cannot be made to their atomizers at present, as the tips are movable.

†By cold sprays I mean in this place and elsewhere, having a temperature of about 80° F.

differ. My own belief is that as a *cleansing* instrument for diseases of the anterior and middle nasal passages, no one is more generally useful than Leffert's (fig. 1)



FIG. 6.—RIKER'S HARD-RUBBER ATOMIZER.

Whenever these parts are partially, or completely coated with mucus, or pus in a fluid, semi-solid, or dried, inspissated state, the more or less frequent and prolonged use of a coarse spray is our best means of ridding them of these secretions.

The fountain syringe and Davidson's syringe are both objectionable:

1. They may occasion median otitis by reason of an excessive flow of fluid, which fills the nose, and under pressure may pass into the eustachian orifices.
2. The stream of watery fluid which is made in their use is more irritating to the pituitary membrane than a coarse spray.
3. The fluid does not reach the upper portion of the nasal fossæ, and naso-pharynx, as a rule, and hence does not loosen and detach morbid secretions from these regions so thoroughly.

On the other hand, in instances of old fetid and atrophic coryza, the time required for the effective use of a coarse spray is often so considerable, that we are glad to recur to the use of instruments which furnish a large amount of cleansing fluid in a short time. In ridding the naso-pharynx, therefore, of secretions similar in character to those mentioned in the anterior and middle nasal passages, a moderately coarse spray may be used at times advantageously, but when the mucous is very hard and adherent, it is preferable to employ the posterior nasal syringe (fig. 7), as we cannot then use the spray long enough, on account of intolerance of the patient's throat, to render it entirely satisfactory. In the larynx, the Sass apparatus, downward spray *in all cases* where mucus and pus are visible in this organ, is the best *cleansing* means. Rarely, however, are we forced to combat in

the larynx the formation of hard crusts like those which are so often present in advanced chronic disease of the nasal passages, and naso-pharynx.



FIG. 7.—POSTERIOR NASAL SYRINGE.

of the respiratory tract. The result is that very many people suffer from recurrent attacks of acute catarrhal inflammation of this region, or from chronic catarrhal inflammation upon which an acute attack, more or less severe, is being almost continuously grafted. The individuals to whom I refer, and of whom there are such great numbers in New York at least, are hypersensitive so far as their respiratory mucous membrane is concerned. They cannot withstand the slightest draught of air. Even a moderate change of temperature or atmospheric moisture will occasionally give them an attack of sneezing or coughing. Their passage from a warm to a cold room, or vice versa, going to the theatre, or into a crowded ball-room, sitting at dinner near a door partly open, being at a concert for an hour or more with a window sash drawn down at the far removed end of the room; all of these slight causes, and many others, *i. e.*, such as fatigue, excess in eating or drinking, emotional strain, are, each and all, sufficient at times to become efficient factors in the production of coryza; pharyngitis, laryngitis, or bronchitis. If such an individual come to us for treatment, as of course he often will, what shall we do for him? Shall we further increase the injurious influences to which he is, more or less, of necessity exposed, by telling him to make use daily of a *cold*, watery fluid introduced into his nose, mouth, larynx, or bronchi, under the form of a fine spray? If we do, I am now convinced that in a certain pro-

portion of cases of nasal inflammation we unquestionably do our patients harm, and particularly is this true if the local treatment be persisted in for any considerable length of time. The harm done in these cases is without doubt occasioned by the imbibition of the turbinated bodies with cold watery fluids, even though of proper density, which at once irritates and causes them to swell. This injurious result is more likely to follow the use of cold sprays than of those suitably warmed. Yet if, in cold weather, we warm the fluids, the pituitary membrane is rendered even more sensitive than before to changes of temperature, and if it be afterwards exposed to contact with the outer air, occlusion more or less permanent, from local irritation or contact is sure to be produced. The only way to obviate this undesirable consequence in part is to interdict the patient from leaving his room during one hour after the use of the warm spray through the nasal passages. Even though this precaution be observed, in order to re-establish by degrees the ordinary state of local circulation, the bad effects of such treatment are so obvious as to be convincing, at least from a clinical standpoint.

In catarrhal diseases of the naso-pharynx the use of sprays, moderately coarse, or fine, are scarcely ever injurious. Indeed, in the great majority of cases in which this space is affected by acute or sub-acute inflammation, they are not merely grateful to the patient, but in a less or greater degree, beneficial. I

have little doubt that in *acute and sub-acute* inflammation a properly formulated and moderately fine spray, applied one or more times in twenty-four hours, moderates irritation, reduces the quantity of the secretions formed, changes their physiological character for the better, and tends to diminish the thickening, or infiltration of soft tissues, which has taken place in a more or less rapid manner. Unless, however, these applications be followed by the use of a stronger topical application under the form of powder or liquid, made by means of the brush, sponge, or insufflator, the patient does not, except in very acute cases, get all the local treatment which his case requires. In *chronic* inflammatory disease of this region, except as a cleansing means, sprays, as ordinarily employed, are of questionable utility. One may persist day after day, week after week, and month after month, in the use of weak sprays, and if these be the sole curative measure employed, patients do not notably improve, as a rule, under the unfavorable surrounding circumstances. I mean by this, that they do not improve if the outer air be cold, damp, rainy, blustering, or contains much irritative dust. I eliminate from present consideration, daily employment, habits, and ambient conditions other than those mentioned, because these are not different with the majority of individuals during any considerable time.

In these cases strong astringent or alterative

applications, preferably of fluids, combined or not with a proportion of glycerine, *must* be made once, twice, three times a week, or every day for a time as the condition may clearly indicate. If this be done and all theory be set aside for the while, such patients as a rule improve and ultimately recover—this latter result depending much upon the *skill* and *knowledge* of the practitioner and the fidelity of the patient to prescribed local treatment.

The general treatment of course is assumed to be precisely what it would be if the patient were treated solely by sprays.

Why, it may be asked, cannot *strong* sprays be used with as much, or more, good effect in chronic catarrhal disease of the naso-pharynx, as when local treatment is carried on by means of strong applications made with the sponge, cotton, or the brush. For two reasons; first, because such applications are very painful; second, because their action is not sufficiently limited and they come into contact with adjacent parts, whose condition, or structure, is opposed to this ill-advised treatment, and hence a manifest *revolt of function* is the consequence, as shown by distressing, and often lasting, symptoms thus produced.

Some such sufferers were victims of the specialists, only a few years since, who pretended to cure chronic follicular diseases of the naso-pharynx by means of concentrated nitrate of silver and other caustic sprays

repeated many times at short intervals. In the fauces and pharynx, while moderately coarse sprays are frequently serviceable and grateful in removing morbid secretions, fine sprays suitably medicated have rather more curative effect than they have in the nasopharynx. Indeed, for acute, or sub-acute inflammations of these regions which have existed but a short time, I should not like to be left without this means of local medication. Some patients, particularly small children, and nervous, debilitated women, cannot gargle at all; few persons, men or women, can gargle *effectually*. It requires instruction to know *how* to do it; it *requires habit* to be able to accomplish it. Troltsch has shown this, and Roosa has further insisted upon it. In chronic pharyngitis, accompanied by more or less inflammation and thickening of the palate, fauces and tonsils, *cure* takes place, as a rule, not on account of the repeated use of the spray, but *mainly* on account of the *astringent* and *alterative* applications made with the sponge, or brush after morbid secretions are removed by means of the spray.

I do not wish, however, to be quite as formal in my small estimate of the utility of spray applications, as I am in regard to this treatment of chronic diseases of the nose, or even the nasopharynx. Indeed, I am confident that in many neuro-pathic disorders of the pharyngeal wall due to inflammatory infiltration, and in many cases of similar infiltration unaccompanied by marked hyperæsthesia,

undoubted and lasting benefit has been attained by treatment solely with sprays.

In the treatment of diseases of the larynx, I am of the opinion that sprays are frequently very useful in allaying cough, and irritation, diminishing sputa and abolishing the objective signs of inflammation *i. e.*, redness and thickening.

Attention, however, should here be directed to some important considerations.

The spray must be a very fine spray in order to be deeply inhaled. It must be projected against the pharyngeal wall with a certain force, or directly downwards beyond the base of the tongue, so as to reach directly the interior of the larynx and medicate it properly.

The ordinary hand-ball atomizer is of very little, or no practical use. The spray thus produced, does not usually penetrate the larynx, but simply lodges in the back of the throat and every few moments is spit up. Occasionally, some of the fluid gets into the larynx and trachea, it is true, while the patient is making efforts to inhale it, but instead of proving beneficial it occasions immediate distressing cough, sometimes followed by retching. These symptoms are evidently brought on by the *coarse quality* of the spray, for which there is usually great laryngeal intolerance. In the treatment of diseases of the trachea and bronchi, as in that of the larynx, if sprays be employed, spray tubes made after the manner of those of

Sass, and connected by means of rubber tubing with a cylinder of compressed air, are alone practically useful. I do not, however, commend the use, even of these fine sprays, so much now as I formerly did. In acute catarrhal diseases of the *lower air passages* and when the patient remains in his room for several days, I have found them occasionally useful. In many such instances they have no appreciable utility. Whenever the affection has become sub-acute, or chronic, the temporary relief afforded by their use is more striking, and rarely, perhaps, they may effect, unassisted, a cure. I am inclined to believe from clinical experience, that fine sprays penetrate into the smaller subdivisions of the bronchi, when they are properly and deeply inhaled. Despite the carrying out of this condition, however, they are not invariably soothing and kindly in their action. Frequently they are either relatively inert, or else, as is occasionally remarked, they produce local, artificial irritation which renders the patients worse rather than better, and more susceptible to sudden, or even moderate changes of temperature.

In regard to the duration of application, or frequency of repetition, of sprays in the affections considered, a general rule only can be formulated. In *acute* inflammation of the nose, and naso-pharynx if employed they should be continued but a very few minutes. In the latter region, they may be repeated with benefit three or more times in twenty-four hours.

In acute inflammation of the pharynx and larynx, a fine spray may be continued three to five minutes, and be repeated every two or three hours, if found to afford relief from annoying or painful symptoms.

In chronic disorders of the kind considered, either in the nose, naso-pharynx, pharynx, and rarely in the larynx, trachea and bronchi, these sprays may be employed as a cleansing means, so often and so long as is required to rid the patient of objectionable secretions. As a curative means, twice a day is as frequent as they should ever be employed, and their duration may be, depending upon the organ involved, from a few seconds to several minutes. After a time, in the diseases referred to, sprays ought not to be used oftener than once a day, or once every other day.

If sprays be used too frequently, in chronic diseases of the air passages, they finally produce a relaxed condition of the parts, and besides by accustoming them to a form of repeated artificial irritation, they rather tend to prolong diseased action than to be curative.

CHAPTER II.

STEAM ATOMIZERS.

In the steam atomizing apparatus the medicated fluid is made to rise in a vertical spray tube by means of a current of steam passing through a horizontal tube. The horizontal tube enters the upper portion of a small metal boiler, where the steam is generated by an alcohol lamp placed underneath. The appa-



FIG. 8.—CODMAN & SHUERTLEFF'S STEAM ATOMIZER.

ratus is essentially provided with a boiler, an alcohol lamp, a receptacle for medicated fluid, a safety-valve, a face-protector or shield, and a drip pan. The steam medicated spray as it leaves the atomizing tubes, has a temperature of 130° F., and a temperature of 100° F., at the spot where it is inhaled, viz., the further, or distal extremity of the face shield.

An approved form of steam atomizing apparatus which is frequently used by general practitioners, is shown in the accompanying figure. It is constructed on the principle of the original instrument of Siegle.

I now rarely make use of inhalations of medicated spray produced by steam. Sometimes in the treatment of acute affections of the pharynx and larynx they have undoubted efficacy, but they are troublesome to manage properly, and unless employed with many precautions, are productive of decided harm by increasing the patient's liability to contract more serious inflammatory diseases than that from which he is already a sufferer.

In acute coryza their utility is questionable, and it is difficult to adjust a suitable nozzle so as to make them practical. In view of the latter fact, in the infrequent cases in which I consider medicated moist heat of appreciable value in the relief of a patient's distress from acute coryza, I prescribe a vapor inhalation in preference to a steam atomized fluid. In the treatment of chronic inflammatory disease of the pharynx and larynx, trachea and bronchi, steam inhalations are rarely of any permanent value, increasing notably as they do, the amount of mucous secretions.

In atrophic, nasal, and post nasal catarrh, in which the crusts are hard and adherent, I have occasionally known temporary benefit to be due to the use of these inhalations. They loosen the

crusts so that they can be blown from the anterior nasal passages, or hawked down from the naso-pharynx without great effort and strangling being incurred. As a means of deodorizing nasal secretions, they are also occasionally useful in these conditions and should be commended with moderation. Even under these circumstances, however, they should not be continued any longer than is evidently necessary for the detachment of hardened crusts, and always after their use the patient should be particularly careful not to expose himself to too great or sudden atmospheric changes, and thus perhaps contract some acute respiratory inflammation. Irrespective, indeed, of the action of warmth and moisture, which always make patients specially sensitive as regards taking cold, the existing disease of the nasal passages seems to me a predisposing cause of much importance. In acute pharyngitis and laryngitis, steam atomized inhalations may be repeated with advantage every hour, or two, until localized pain, swelling and soreness have markedly diminished. Of course in laryngitis we may be somewhat guided in their use by the degree of dysphonia, or aphonia. The latter symptoms, however, are not a reliable guide by themselves, since they are frequently more marked when the inflammatory condition has subsided, than they were during its continuance. This fact may be explained by the loss of power in the intrinsic laryngeal muscles which often follows an inflammation of the mucous membrane of this organ,

and may persist, more or less, during several days. During the entire time when the patient is repeating the warm inhalations with so much frequency, he should be urgently advised on no account to leave his room unless it be to move into an adjoining chamber in which the air has been carefully kept at a similar temperature to the one just left. All exposure under these circumstances, is extremely dangerous. Whenever a patient makes use of these warm inhalations two or more times each day, he may, perhaps, go into the open air after an hour without great risk, yet I doubt if this rule be followed whether any marked benefit will result from such inhalations. Reason is against the use of warm, or hot inhalations, if the patient persist in exposing himself never so little, and practice confirms the safe-guard which reason formulates in such decisive language. In any case in which warm or hot inhalations appear to be indicated, and in which the patient is forcibly compelled to expose himself during the day, let the inhalation be reserved for the evening, at such an hour as will permit the patient to remain in the same room until he retires for the night. When covered up in bed, if it be deemed essential to effect a cure, the warm inhalation may frequently be repeated with great immediate comfort and some lasting benefit.

mendable inhaler, somewhat simpler and almost as good practically, is that of Maw (fig. 11). A third kind, known as the London Inhaler, is made of tin



FIG. 10.—THE ELECTIC INHALER.

with a convenient cover of the same metal, shaped so as to carry medicated vapor readily into the nose, or mouth (fig. 12). In a general way the principle of these last mentioned inhalers is very simple and not

dissimilar. A single quite large orifice is left in the lid of the inhaler, or a series of holes are placed around the rim of the cover of the receptacle for hot medicated fluid in such a way that a current of air is drawn downward with each active inspiration. At first it passes through an air chamber, which, in Mackenzie's and the London Inhaler, is situated between



FIG. II.—MAW'S INHALER.

the sides of the cover and the sides of the reservoir for the fluid, projecting downward somewhat like an inverted tumbler. In Maw's inhaler the air chamber is simply formed by the upper portion of the receptacle into which the fluid does not reach. In the first two, after passing through the air chamber the inspired air passes through the upper layer of liquid and afterward a series of holes near the lower margin of the

cover. Once in the tumbler-shaped cover it is drawn upwards into the mouth-piece (Lond. Inh.), or rubber connecting tube terminating in a mouth-piece (Mack Inh.). In Maw's earthen-ware inhaler the surface



FIG. 12.—THE LONDON INHALER.

alone of the liquid is brought into contact with the inspired current of air.

In either form of inhaler the air while passing through or over the surface of the hot fluid, is impregnated with the volatile medicament, and at the

same time becomes properly heated. In Mackenzie's and Maw's inhalers the mouth-piece is perforated on the top by a valvular orifice.

During expiration the air from the lungs passes directly through this hole, and is prevented from returning to the inhaler by a similar valve of larger size, which shuts inwards. Dr. Mackenzie's inhaler is also provided with a thermometer, which passes down the side of the inhaler and registers accurately at every moment the temperature of the contained fluid. The desired degree of heat is kept up by means of an alcohol lamp resting upon a stand under the reservoir. This temperature should be about 140° F., or one at which most of the volatile substances brought into use medicinally, are vaporized in a sufficiently rapid manner for practical purposes. Steam inhalations by means of these different inhalers may be employed with benefit under circumstances when warm atomized inhalations are also indicated, as already referred to.

One special advantage which belongs to the former, and not to the latter, resides in the fact that they are more readily made use of in many cases, since they do not require necessarily any special form of apparatus. On the other hand, they have this notable disadvantage that they oblige the patient to perform repeated acts of somewhat forced respiration in order to inhale effectually, and this becomes very fatiguing to nearly all patients, and to some in a very weak state it is

impossible. Again, I do not believe the vapors penetrate as deeply or thoroughly into the larynx, trachea, or bronchi, as when the steam atomized-fluid inhalations are used.

CHAPTER IV.

VAPOR INHALATIONS.

The agents used for this purpose must be more or less volatile and are usually balsamic or antiseptic. The inhalers themselves are usually portable. There are many different kinds; some are complicated, burdensome to wear for any length of time, and relatively expensive.

After examining a large number and making use of several modifications of the ordinary oro-nasal inhalers, I have finally concluded that one of the best is also the simplest and cheapest. This inhaler, which is now known in New York as the perforated zinc inhaler, was originally made by Squire, of London, and since that time it has been slightly modified for me by Mr. Ford, of New York. I have been using these inhalers extensively for a year or more, and consider them a valuable addition to our appliances for facilitating inhalation.

They consist simply of a sheet of perforated zinc or tin, bent into a pyramidal shape and large enough to cover conveniently the nose and mouth. At the apex of the pyramid a bit of sponge is firmly held by means of strings, or two bends in the margin of the zinc plate. Between the sponge and the mouth and nose there is a vacant space which obviates the stifling

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feeling, which is so objectionable in the use of inhalers that are applied loosely over the face. The inhaler is

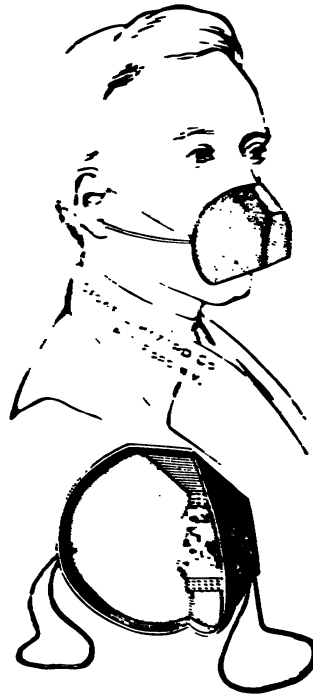


FIG. 13.—PERFORATED ZINC INHALER.

held in place by two narrow elastic bands which pass around the ears. Before beginning an inhalation

the sponge should be properly moistened with water or alcohol, and the inhaling fluid poured upon it.

With each inspiration, when the inhaler is in place, and the sponge properly medicated, a current of air passes through the sponge and perforated zinc plate, carrying with it a perceptible amount of the volatile agent and is drawn into the nose or mouth. During expiration the air passes out in part through the sponge and in part also through the small perforations of the zinc. The inhaler may be improved at times by covering a considerable portion of the sides with silk, so that there is a stronger direct current of air passing through the sponge with each effort of inhalation and less intermixture of air entering the inhaler from the sides. Valvular orifices may be made on the sides of the inhaler if the silk covering be added, so as to facilitate expiration, allow the exhaled breath to escape, and prevent it from passing through the sponge. This is objectionable because unless largely obviated one inhales with each inspiratory effort an appreciable amount of air already breathed once.

Another inhaler much more elaborate and expensive, non-portable, but very valuable in numerous instances, is that known as Beseler's globe inhaler. In this instrument a large globe with small projecting and somewhat flattened extremity for the mouth, all made of one piece of glass, is supported upon a vertical metallic stand. In the posterior part of the globe



FIG. 14 — BESELER'S GLOBE INHALER CONNECTED
WITH AN AIR-RECEIVER.

are two short atomizing tubes, the lower one of which, by means of a connecting rubber tube, passes out of the globe, through a small orifice made in an occluding metallic plate, into a small receptacle for medicated fluid. The other tube is connected by means of rubber tubing, terminated by a metallic cut-off, with a cylinder of compressed air worked by means of a suitable pump. The glass globe can be lowered or heightened at will by means of a sliding metallic rod in the stand and be fixed in place by a screw. It can also be turned horizontally in any direction. When in action the air from the cylinder reduces the liquid from the receiver to the form of a fine spray of which the heavy globules fall into the glass globe, while a column, practically regarded, of medicated vapor issues constantly from the projecting mouth-piece of the globe. For the sake of cleanliness and adaptability, I have added to the globe, nozzles for the nose and the mouth and these can be readily slipped on or off the projecting glass mouth-piece by means of a soft rubber attachment.

In addition to these two forms of inhalers, there is another apparatus, somewhat on the same principle as the globe inhaler, manufactured by Parke, Davis & Co., and known as Semple's inhaler. In this inhaler (fig. 15), which is quite portable although not to be worn by the individual, the fluid is vaporized by a rubber bulb. The receptacle for the fluid is situated in the lower portion of the receiver from which it is

drawn up, owing to the cohesiveness of air (Smith), and vaporized in the chamber above by means of atomizing tubes. A metallic tube provided with a small nozzle, comes out of the upper chamber, and carries in it the



FIG. 15.—SEMPLÉ'S ATOMIZING INHALER.

vapor for inhalation. This inhaler may be made use of advantageously in connection with a cylinder of compressed air, instead of a rubber hand-ball. Under these circumstances, however, preference should be accorded to the globe inhaler as being a

more serviceable instrument. Still, as there are a very large number of general practitioners who cannot afford to buy an instrument as expensive as the globe inhaler, Semple's inhaler will find its proper place. This is, also, true for patients who cannot visit the physician's office, or who for different reasons, pecuniary, or otherwise, must be treated at their homes.

In the London Lancet,* Dr. Hassall has written a strong article in favor of "a new method of inhalation and a new form of apparatus." In this communication it is claimed that by the passage of relatively dry air through a fluid medicated with carbolic acid and of which the temperature may be somewhat raised, a large amount of medicated vapor is carried deeply into the lungs and will there undoubtedly produce very evident curative results.

The apparatus of Dr. Hassall is very simple, consisting mainly of rather a long cylindrical vessel (fig. 16.) through which three small tubes pass and extend into the liquid to be inhaled. The remaining tube is one by which the invalid is to make inspirations repeatedly. When an inhalation of one hour or more is terminated, a relatively large proportion of carbolic acid has passed over into the lungs, and must medicate them very thoroughly. Although, judging from its description, we have in Hassall's inhaler a useful addition to this class of instruments, yet I do not

* January 30, 1886, p. 192.

think it is so perfect as the globe inhaler, mainly because the effort of inhalation is considerable, whereas, with the latter there is no effort at all, and the *air*

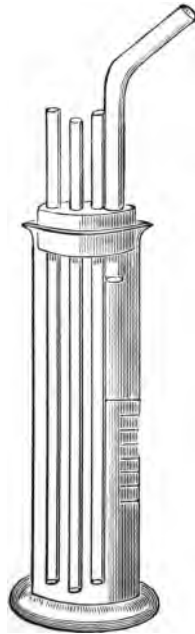


FIG. 16.—HASSALL'S INHALER.

breathed must be saturated with any volatile substance employed.

Inhalations of volatile balsamic and antiseptic

substances, employed by me in the oro-nasal inhaler, and latterly, also, in Beseler's globe inhaler have proved to be more or less useful in almost every form of acute and chronic catarrhal inflammatory disorder of the nose, naso-pharynx, larynx, trachea and bronchial tubes. It is no exaggeration to say even at this time, and before ultimate conclusions can be properly formulated, that in my judgment, we have in the method of vapor inhalation with the globe inhaler, a distinct advance over what has been previously practised. In many instances, undoubtedly, it is superior to other kinds of inhalation and apparently there are no decided objections to its general adoption.

In the use of cold, atomized inhalations there is the objectionable feature at times of low *temperature* and *always* the one of an excessive proportion of water, which cannot be lessened very much as remarked before, on account of the pain occasioned, or the intolerance of surrounding parts of a more impressionable, or sensitive structure.

In the use of steam atomized inhalations, or warm vapor inhalations, the heat and excessive moisture are both frequently undesirable because they increase notably the susceptibility for fresh attacks of coryza, pharyngitis, laryngitis, or bronchitis.

Does not *our general experience* teach us clearly that the points urged by me against the indiscriminate use of hot, or cold atomized inhalations are both theoret-

"Medical Record, March 18, 1882; J. Burney Yeo, in his "Lectures on Consumption," London, 1882; J. Solis Cohen, in Philadelphia "Medical News," October 11, 1884; J. Ward Cousins, "Lancet," July 19, 1884; and A. Hill Hassall, "Lancet," August 16, 1884, and "Inhalation Treatment," London, 1885.

In favor of this method may be cited the following propositions: 1. There are no risks of future colds attendant upon its employment. 2. The relief afforded by inhalations of the vapor of volatile substances is, in my experience, frequently greater than that given by the other methods of inhalation. 3. This medication is well adapted to all forms of irritative diseases of the respiratory passages. In favor of this method, when employed by means of the ordinary portable oro-nasal inhaler, it may be additionally claimed, that the apparatus required costs but a trifle, and may be used, therefore, even by the poorest classes.

I know of only one serious objection which can be properly urged against its very general adoption, and it is the statement that the vapor of volatile antiseptic, or balsamic substances, when they are employed in the ordinary oro-nasal inhaler, or in the globe inhaler, do not penetrate far enough to reach the larynx or bronchial tubes, and therefore cannot modify the mucous membrane of these structures in any sensible degree. Upon experimental grounds, Arthur Hill Hassall ("Lancet," May 5, 1883) has endeavored to show that the agents most fre-

quently employed hitherto, such as carbolic acid creasote, thymol, etc., are but feebly volatile at ordinary temperatures. He has been unable, after prolonged inhalation with the ordinary oro-nasal inhaler, to recover any notable quantity of these substances in the sputa, or secretions from the air-tract. In fact, he has not even remarked that the sputa, soon after they were expectorated, were penetrated with their odor. Indeed, after continuous inhalations of one or two hours' duration, he has succeeded in obtaining, by Chandelon's process, from the sponge or cotton in the inhaler, very nearly the whole quantity of the agent employed.

A sufficient answer to these objections, it seems to me, may be found in the fact that the patients themselves, when questioned after they have used the inhalations during a few days, or weeks, almost invariably reply that their subjective symptoms have been notably relieved. Not only do they make this statement, but they add, further, that their sputa have diminished in quantity, and at times have notably changed in appearance. Moreover, while I am willing to admit that such vapors, when obtained by means of the ordinary oro-nasal inhaler do not enter the bronchial tubes so deeply as we might presume, or desire—yet even by means of this inhaler they probably penetrate as far, or farther, than the sprays for which they are frequently advantageously substituted. In regard to

the globe inhaler worked by means of a pressure of 15, 25, or more pounds to the square inch, I am convinced these objections of Hassall would hold even less—but in regard to the application of these objections to this instrument, no experiments have yet been made, other than those obtained by close clinical observation of patients.

These observations, however, prove to me conclusively that even the smaller bronchi are thus favorably modified by suitable inhalations properly used. I am of the opinion, also, that the small loss of the volatile substance which has not been recovered in Hassall's experiments with the ordinary oro-nasal inhaler, and which *possibly* does penetrate not only the small bronchial tubes, but the pulmonary air cells themselves, is sufficient to modify notably, after several days or weeks of more or less continuous inhalation, the inspired air in such a manner that it is made comparatively aseptic, and thus we have an influence for good that we can properly estimate only by the evident effect produced.

If this be true for the ordinary oro-nasal inhaler, it is in a much greater degree true with regard to the use of Beseler's inhaler.

In regard to the areas of cough in different organs of the respiratory tract, this much can now be affirmed in view of experiments by Hack, J. H. Mackenzie and myself viz., that these areas are probably more or less *limited*, and if, therefore, we reach this

YASSEL BBA

sensitive area thoroughly with our remedial measures, it is not essential for the arrest of this symptom that we should be able to medicate the whole inflamed tract.

In commencing bronchitis, particularly when it is situated in the upper divisions of the primary bronchi, cough is a specially obstinate and constant symptom. In the other localizations of bronchitis, *cough* very frequently has only moderate intensity and occasions relatively much less annoyance and distress. Again, it is proven in certain diseases, as for example, chronic dysentery, that a local application to the ulcerated rectum, may be the means of producing such changes that the ulcerated bowel far above the points of contact with the acid will soon recover their tone and normal function, and the patient get entirely well. It will be objected that this is scarcely an analogous condition. Perhaps it is not, but analogy even though remote serves to illustrate and to enable us sometimes to appreciate facts which otherwise would be shrouded in great obscurity. At all events, the results of my experience with vapor inhalations up to the present time, prove clearly the utility of this method in all catarrhal affections of the throat and chest; including particularly those cases of pulmonary phthisis which, are now considered to take their origin in tubercular disease, and yet are accompanied by well marked catarrhal complications,—in the form of

localized, or generalized bronchitis, with more or less active hyperæmia of portions of lung tissue.

In acute and chronic nasal catarrh inhalations of vapors are agreeable and useful. While the ordinary oro-nasal inhaler may be beneficially used, as was my habit some months ago, I must insist that Beseler's instrument is really much more valuable. By its means the effect in acute coryza is occasionally, very remarkable. Inhalations of compound tincture of benzoin, combined with an equal portion of alcohol and glycerin have latterly seemed to me particularly commendable in these cases. The effect of the inhalation is to stop in a great measure the sneezing and serous flow from the nasal passages. After a few inhalations, also, the stuffiness of the nasal passages is greatly diminished.

In cases of *chronic nasal catarrh* dry inhalations frequently repeated diminish the discharges from the nose very much. And this is true not only of the anterior and middle nasal passages, but also of the nasopharynx.

Whenever the nasal passages are more or less occluded by reason of the swollen mucous membrane covering the septum and turbinated bodies, this condition will often be much improved and the breathing rendered notably freer. In those instances in which there is accompanying aural catarrh affecting the Eustachian tubes, or the tympanic cavity, these inhalations, particularly with the large globe inhaler, are

specially desirable and beneficial, and the patients soon express a sense of relief and improvement. The upper portion of the naso pharynx, however, will still require applications of compound tincture of iodine twice or three times a week, in order to show the best effects from local treatment.

We must not expect, however, the impossible from dry inhalations in these cases of chronic nasal catarrh and look always for manifest improvement rapidly and in all cases. Sometimes weeks, nay even months, may elapse before the patient will be able to note that he has steadily and permanently improved. As compared, however, with all other methods of inhalation hitherto in vogue in the treatment of chronic inflammations of the nose, this one is so satisfactory that I throw out a warning voice so as not to allow myself to be too enthusiastic. It must not be inferred, however, because I recommend the use of dry inhalations so strongly that I therefore consider it proper to put aside all other treatment, both local and general. Not at all, for I still hold with conviction, to the use of remedial agents elsewhere indicated by me.* By comparisons, however, between my cases of chronic nasal catarrh, in which vapor inhalations were employed, and those in which these inhalations were not used, although internal remedies were often inhibited in both cases, I believe these inhalations are de-

* Nasal Catarrh, and Allied Diseases.

cidedly beneficial in the manner stated above. In an instance in which nasal catarrh was complicated by epiphora, due to occlusion of the nasal duct by a swollen pituitary membrane, dry inhalations relieved this symptom in a measure.

In dysphonia, frequently connected with, or dependent upon, chronic nasal catarrh, vapor inhalations will often produce marked benefit to the voice and to the general condition of the pharynx. This it accomplishes in one of two ways: "By diminishing local inflammation which has extended to the pharynx, or by restoring nervous power to the pneumogastric trunks as they pass down alongside the pharyngeal walls, and through them giving more tone to muscular contraction of the intrinsic laryngeal muscles. Vapor inhalations are undoubtedly useful in the treatment of simple chronic pharyngitis, and in this disease when accompanied by numerous enlarged follicles. They diminish the amount of secretion, while promoting the healthy functional activity of the glands of this region, and lessen and cause to disappear, at times, those painful feelings in the throat which are often the source of anxiety and considerable annoyance to debilitated patients in whom a neurotic element predominates.

In Acute and Chronic Laryngitis.—In these affections they quiet irritation, lessen hoarseness, diminish cough, change the aspect of the inflamed mucous membrane, and, in certain cases at least, evidently

hasten the disappearance of symptoms and the establishment of a cure. In one case, in which there was concomitant post-nasal catarrh, pharyngitis sicca, and paresis of the tensors of the vocal cords, producing hoarseness, there was also "a red, swollen epiglottis, arytenoid cartilages, and ventricular bands."

In this case there was moderate cough, still it persisted and caused much mental distress, despite various medications internally, and numerous local applications of pigments, sprays and powders. One week after inhalation was begun the cough had disappeared completely. The larynx was less inflamed, the pharynx was not at all glazed, there were little or no frothy sputa, and, indeed, the patient was so far recovered that the dry inhalations were stopped. These consisted of ten drops of turpentine used in Kinnicutt's inhaler during five minutes every three hours.

In cases of *acute, sub-acute, and chronic bronchitis* these inhalations are markedly beneficial, and deserve further and more extensive trials on the part of the medical profession. In acute bronchitis inhalations of compound tincture of Benzoin, or of oil of tar are productive of great ease to the patient in lessening the hard, irritating cough, and the tightness over the anterior thorax which is usually present in these cases to a more or less marked degree. In sub-acute and chronic bronchitis, inhalations of tincture of benzoin and fir-wood oil—one part of the latter to eight parts

of the former—after one, or several weeks, diminish the cough, expectoration and hoarseness. In one instance the patient stated distinctly that the cough was stopped by the inhalation. The amount of the fluid used with the oro-nasal inhaler was ten to fifteen drops, one or more times a day, and the inhalation was repeated ten minutes every three hours. If the globe inhaler is used, the contents of the receptacle may be inhaled upon each occasion as a rule. Sometimes only one-half of this amount will be required. Sometimes, though very rarely, twice as much as the receptacle holds may be advantageously used on each occasion. Of course it is understood that nine-tenths of this, or more, of the inhalant employed at any one time in the globe inhaler, falls back into the globe and may be utilized a second time with the same patient for future inhalations.

In pulmonary phthisis, at its initial stage, or at a more advanced period, and whenever accompanied by a catarrhal condition of one, or both lungs, localized or not, much benefit is derived from vapor inhalations.* The result of my observations would seem to show that the most generally useful inhalation in the beginning of pulmonary phthisis is creasote and alcohol, equal parts. Creasote by itself is a little too irritant,

* I merely refer here to the utility of vapor inhalations in the treatment of catarrhal complications of pulmonary phthisis, although I am of the opinion, as I have written elsewhere, that tuberculosis is also benefited in this way.

and is not so readily manipulated. Whether or not the mixture of alcohol increases its volatility I am not positive, although I believe it does, regard being paid to the statements of patients. At the present time, whenever the cough is distressing, I add an equal quantity of spirits of chloroform to the creasote and alcohol, and find the patients express a sense of the benefit received after a short trial of this combination. If the oro-nasal inhaler be used in these cases, the amount of inhaling fluid employed with best results, varies from ten to twenty drops. It is also renewed most advantageously two or three times in twenty-four hours. After one or two weeks inhalations could be continued without unpleasant effects, one-half or one hour at a time, and repeated three or four times in twenty-four hours. If a larger quantity of the inhaling fluid were used at first upon the sponge of the oro-nasal inhaler, or if at first the time for each inhalation was extended beyond fifteen minutes, the patient on several occasions suffered from irritation of the throat and increased painful cough.

And yet one of the objections urged against the efficacy of most oro-nasal inhalers is the fact that too small a supply of vapor is given off from the small bit of sponge, cotton, or tow, which comes with them, to be of any benefit to the patient. In the globe inhaler of Dr. Hassall, this writer has remedied the supposed defect. For my part, I have not usually found it a defect, even of the ordinary oro-nasal inhaler, and with the combina-

tions, or mixtures of medicinal remedies employed hitherto by me in this method of inhalation, rarely have I found the slightest difficulty in supplying my patients, by means of the perforated zinc inhaler, with all the medicated vapor they could comfortably endure. Indeed, I have observed several times, as other observers have done before me, that the quantity of antiseptic or balsamic liquid added to the sponge of the inhaler must be limited to a few drops (10 to 20), if the inhaler is worn more than a short time. If a relatively large quantity of volatile pungent, irritating fluid be added to the sponge, the vapor proceeding from it is too concentrated and shortly becomes very intolerant to the air passages and must be abandoned altogether, or the inhalant modified as to quantity, or combination. Instead of doing good, therefore, by increasing the quantity of fluid upon the sponge of the inhaler, we occasionally do actual harm and render a very serviceable agent a decidedly objectionable one. I am, therefore, not of the opinion of Dr. Hassall as regards this point in inhalation, viz: that with the ordinary forms of oro-nasal inhalers we do not volatilize a sufficient quantity of antiseptic, or balsamic fluid to be of service as an inhalant; and that when we volatilize sufficient fluid, not enough vapor is inhaled to modify the air cells to any notable degree. I shall not attempt to combat these statements of Dr. Hassall as regards the Beseler globe inhaler, because if I do not admit their truth for the ordinary

oro-nasal inhaler, in which the only power present is that of the in-drawn current of air during ordinary inspiration, I would not consider them to apply to the globe inhaler, since in inhalations from Beseler's inhaler, we have in addition all the power afforded by any number of pounds pressure (in reducing a given fluid to a state of vapor) which we shall deem advisable. Of course, it is understood, therefore, that, in a certain measure at least, the proportions of active ingredients suitable in the oro-nasal inhaler are not always appropriate for use with the globe inhaler of Beseler.

This is, also, evident when we consider the relatively large amount of vapor which is inhaled in quite a short period in the globe inhaler as compared with the oro-nasal inhaler.

In regard to the influence on the *cough* in various conditions of catarrhal inflammation—both acute and chronic—and with different localizations in the nose, pharynx, larynx, trachea, and bronchial tubes we have observed the following additional effects :

At times, repeated and prolonged inhalation undoubtedly gives a feeling of ease to the throat and chest, and yet frequently the cough is neither arrested nor very markedly ameliorated. This is particularly true of catarrhal disease complicating tubercular infiltration of the lungs. Even in these cases, however, the inhalation seems to give a sort of renewed vigor, and the patient feels decidedly

cheered and encouraged. In rare cases of this kind the inhalation obviously induces cough at the time of its use, but even then it does not appear to permanently irritate the throat or chest.

I desire to direct special attention to one point in the use of all inhalations. Frequently they are useful in allaying cough and the symptoms depending upon it, even though it is evident that the inhalation does not penetrate below, or even so far as the larynx. This fact may be explained in two ways: First, as is well known, the cough may in reality be occasioned by a morbid condition of some part of the respiratory tract, in front of the larynx, although this organ, the trachea and bronchial tubes may also be inflamed.

This morbid condition may be an elongated uvula, post nasal catarrh, chronic pharyngitis, acute or subacute laryngitis, etc.

Again, in the use of all forms of inhalation, while the soothing and modifying effects are partly due to direct local application, still there are similar effects produced by the process of absorption and elimination going on in the mucous membrane lining the affected parts.

In regard to effects of vapor inhalations upon the sputa and dyspnœa in phthisis, where these symptoms depend in a certain degree upon concomitant bronchial catarrh, the following facts have been noted: not only are the sputa diminished, as a rule, by in-

halation, but they show, not infrequently, manifest changes of color. They also become decidedly less thick and viscid, and from being green-looking and tenacious, they are soon foamy, like soap-suds, and thinner, or show the aspect of mingled mucus and pus. The breathing is also improved frequently, and the patient can make more exertion without panting or becoming exhausted from lack of breath. At times the improvement of breathing, of cough, and of the amount and character of the sputa are accompanied by auscultatory changes which seem to indicate improvement as regards the bronchial catarrh located at the apex or apices.

Owing to the diminution of cough and the decrease in the abundance of the sputa, the patient's sleep is not so much disturbed—and thus I have found the use of the dry inhaler during the evening, and even at bed-time, evidently a greater promoter of rest than cough mixtures containing anodynes. This may occur even when direct examination with the mirror shows that the larynx is red, swollen and inflamed.

One of my patients stated in emphatic terms that although she had taken all sorts of drugs for her cough none of them helped her so much as the inhalation.

Frequently patients will do well for a time with one kind of inhalation, and we shall feel greatly encouraged; and then, through some exposure or im-

prudence, the cough again grows worse, the sputa becomes more tenacious, frothy, or difficult of expectoration, and the dyspnoea is increased. Later still all these distressing symptoms are again relieved, but by some new form, or combination of inhalation.

In one case I employed at different times, and during many weeks, extending in all over many months, several different kinds of inhalants. Each one of these relieved for a time and afterward lost its beneficial, soothing effect. Still, everything considered, I concluded I had a means which, contrary to Hassall's opinion, was powerful for good, and, despite failures, was more useful in many instances than steam inhalations, or cold atomized fluids. In not a single instance have I been convinced that vapor inhalations when properly employed—and by this I mean when the quantity of medicinal fluid used and the duration and frequency of inhalation were judiciously regulated—increased the cough except in a very temporary manner, or was productive of any evidently bad results.

The amount of inhaling fluid employed with the oro-nasal inhaler so as to have the best results should vary from ten to twenty drops. This amount may be renewed, most advantageously, two or three times in twenty-four hours.

The dry inhalations used after this manner must be continued at first about ten minutes every two, three, or four hours. After a week or two they

can be continued, without even temporary unpleasant effects, one-half or one hour at a time, and repeated three or four times in twenty-four hours. If a larger quantity of the inhaling fluid be dropped at first on the sponge of the oro-inhaler, or if at first the time for inhalation be extended beyond fifteen minutes, the patient is apt to suffer from irritation of the throat and increased painful cough. These rules should be modified considerably for the large globe inhaler, with which the quantity of the inhaled fluid may vary on each occasion from half an ounce to an ounce, and the time of the inhalation should be limited to between five and ten minutes. During the inhalations, especially at first, even though relatively bland fluids be used, the patient will be forced to stop inhaling for a few moments from time to time, on account of the paroxysms of cough produced.

This cough, however, is not of a violent, or distressing kind, as a rule, and quickly stops so soon as the inhalation is temporarily arrested.

The advantages of the inhalation with the large globe inhaler appear to me greater than those of the ordinary oro-nasal inhaler, 1. on account of the more certain penetration by this method of the balsamic or antiseptic vapors into the ultimate divisions of the bronchi. 2. because a larger quantity of inhaling fluid is vaporized and can be inhaled without enduring unpleasant effects in a short time. The disadvantages are the non-portability of the instrument

and the fact, therefore, that the inhalation can as a rule only be properly taken at the physician's office. These inhalations can scarcely be repeated therefore, more than once a day in any but acute cases, and then only when the patient is able to leave the house.

Of course this difficulty could be obviated, when desirable, by having such an instrument (though expensive) in permanence at the patient's home.

It has been sought to work the globe inhaler constructed somewhat after the plan of Beseler's, by means of two powerful rubber balls, but on account of the lack of power in the balls, or owing to the fatigue caused to the patient, this plan has hitherto appeared to me impracticable.

The better way in the majority of cases is to use occasionally—every day, or every other day—an inhalation from the globe inhaler, and supplement its action by use of the ordinary portable and cheap oronasal inhaler.

CHAPTER V.

MEDICINAL FORMULÆ.

A.—FOR COLD ATOMIZED FLUIDS OR SPRAYS.

1. B Sodii bicarb.,
Sodii biborat., ää 3 j.
Glycerini, 3 ss.
Aquam ad 3 viii.

M. S. Use with the atomizer for cleansing purposes.

2. Whenever the odor of the breath is offensive by reason of the nature of the discharges, the following formula may be advantageously used either as a cleansing and deodorizing solution, or with a view also to its curative action:

- B Acid Carbolici liq., ℥xl.
Sodii bicarb.,
Sodii biborat., ää 3 j—3 ij.
Glycerini, 3 ss—3 j.
Aq. rosar. 3 ss—3 j.
Aquam ad, 3 viii.

M. S. Use with the atomizer.

Instead of, or combined with, carbolic acid in the above formula salicylic acid (grs. xxx), chloral (grs. xx—xl), liq. potass. permang (3 ss), thymol (gtt. x), may all be used advantageously at times, according to the varying indications of the disease, or merely to change the precise nature of the medication

when the mucous membrane of a particular organ has become too much accustomed to a given formula.

3. Among the astringent and stimulant solutions for the nasal passages and naso-pharynx the following can be recommended:

℞ Zinci sulphatis, grs. v, aq. ad ℥ j.
Ferri chloridi, “ “ “
Acidi tannici, “ “ “
Argent. nitratis, “ “ “
Potass. chloratis solutio ad saturand.

These solutions should be made about four times the strength just given for the pharynx and larynx. One drachm of glycerin incorporated with each ounce of the various solutions is usually a grateful and useful addition.

The bromides of sodium, potassium and ammonium (grs. xx—℥ j), extract of opium and belladonna (grs. v), Magendie's solution (℥ x), may be used with any one of the astringent solutions when a sedative action is required—or they may be dissolved in water with the addition of a small quantity of glycerin (3 ss—℥ j).

B.—FOR STEAM INHALATIONS.

1. By means of the *steam atomizing apparatus*:

Any one of the solutions already recommended for the nose, and of similar strength, may be thus employed.

2. By means of *ordinary steam inhalers* (MacKenzie's, Maw's, etc.).

Many formulæ are mainly composed of one or more volatile oils, held in suspension by means of carbonate of magnesia, or prepared kaolin, and made with water to the volume of one or two ounces. Of these mixtures one or two teaspoonfuls should be added to a pint of water at 140° Fah., for each inhalation, which should be employed one, or several times a day, according to the nature and stage of the affection. The following is a formula similar to which several others can be made by merely substituting a different volatile oil :

R Olei pini folii (fir-leaf oil), ℥XL.
Magnesia carbonatis, gr. xx.
Aquam ad, ℥j.

M.

The oils which may at times replace the one above with good effect, are those of cubebs, juniper, myrtle, calamus, lemons, etc. All of these are more or less stimulant in their action, and may be beneficial both in acute and chronic catarrhal inflammations. In the latter the proportion of the essential oil may often be increased. As a rule, from one to ten drops is about the limit of practical utility. Besides the essential oils named, the following substances may be combined in a like manner, viz: terebene, thymol and creasote. From one-half to two grains of magnesia carb. for

each minim of the different substances mentioned above, is the quantity usually employed.

In the ordinary steam inhaler the steam may also be charged with benzoin, iodine, ammonia, camphor, hydrocyanic acid, ether, chloroform, and nitrite of amyl, previously dissolved in alcohol or water, and stirred in suitable proportions into the hot liquid at a temperature from 80° F. upwards, to 140° F. These different substances are sedative, stimulant, or antispasmodic. The inhalations should last about five minutes upon each occasion, and the patient, during their continuance, must inspire slowly and deeply.

C.—FOR VAPOR INHALATIONS.

I.—By means of the ordinary oro-nasal inhaler:

1. Creasote, alcohol, and spirits chloroform, equal parts.
2. Creasote, one part.
Ol. pini sylvestris, two parts.
Compound tincture of benzoin, eight parts.
3. Compound tincture of benzoin.
4. Fir-wool oil.
5. Compound tincture of benzoin and fir-wool oil, equal parts.
6. Compound tincture of benzoin, eight parts.
Carbolic acid and tincture of iodine, of each one part.

7. Pine needle oil.
8. Terebene, four parts.
Spirits of chloroform, one part.
9. Iodoform and oil of eucalyptus, of each two parts.
Creasote, one part.
Alcohol and ether, of each twenty-four parts.
(Dreschfeld).

II.—By means of the large globe inhaler:

1. Tinct. benzoini comp.,
Glycerini,
Alcoholis, ää $\frac{3}{4}$ j.
2. Ol. picis liq., 3 ss.
Inhalant No. 1, $\frac{3}{4}$ j.*

The two formulas just mentioned were taken from Parke Davis & Co.'s list, and have been found very useful by me.

The most agreeable and generally useful fluid, however, I have yet employed in this method of inhalation, is the oil of pine needle, such as I believe was first introduced into this country by Messrs. Gardner & Co., of Sharon Springs, N. Y. This essential oil is

* This is a petroleum product, introduced first, I believe, by Parke, Davis & Co., which is especially adapted for inhalation and for use as a base, or diluent, for inhalants. "It is free from all irritating properties, on account of which it is much to be preferred to similar preparations from which the sulphuric acid, or other objectionable agents used in process of purification, have been imperfectly removed."—(P., D. & C.)

extremely volatile, has a very fragrant odor, and in the majority of instances in which I have used it with Beseler's inhaler, it has been of great service to the patient. Such cases were generally sub-acute, or chronic cases of nasal catarrh, or bronchitis. I have also known the vapor of alcohol to be of considerable use in giving relief in chronic nasal catarrh, by diminishing the quantity of the mucous secretions which are abundantly and constantly formed. Inhalant No. 1 and creasote may sometimes be combined advantageously in the proportion of $\frac{3}{4}$ ss of the latter to $\frac{3}{4}$ j of the former, and employed as an inhalation in cases of more or less advanced phthisis. The extract of pine needle, combined or not, with Sharon sulphur water, has likewise proved serviceable in old cases of nasal catarrh. More than one such case has been under my professional care. Inhalant No. 1 (P., D. & Co.) is not at all miscible with alcohol, and where this liquid is present it must be removed by evaporation with gentle heat and the mixture afterward filtered before it is used in the globe inhaler. This is true of certain fluid extracts (yerba santa) if the proportion of them in the mixture be large, and of the compound tincture of benzoin. Inhalant No. 1 is partly soluble in chloroform and ether, viz: It forms apparently a very fine emulsion with each one of these liquids, and thus combined makes a fluid suitable for use in the globe inhaler.

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